National Water Level Program Support Towards Building A Sustained Ocean Observing System For Climate

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Project Summary

The objective of this project by the NOAA National Ocean Service (NOS) Center for Operation Oceanographic Products and Services (CO-OPS is to develop and implement a routine annual sea level and extreme event analysis reporting capability that meets the requirements of the Climate Observation Program

The fundamental URL's are:

http://tidesandcurrents.noaa.gov for access to all programs, raw and verified data products, standards and procedures, and data analysis reports and special reports.

http://opendap.co-ops.nos.noaa.gov/content/ for access to data through a new IOOS web portal.

http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml for access to the latest NWLON sea level trends and monthly mean sea level anomalies.

http://tidesandcurrents.noaa.gov/sltrends/sltrends_global.shtml for access to the latest sea level trends and monthly mean sea level anomalies for a set of global sea level reference stations

The Climate Operating Monitoring Principles used by the Climate Program Office are very much the same as used for the NOAA National Water Level Program (NWLP) for which the National Water Level Observation Network (NWLON) is a long-term continuous operational oceanographic network that's strives to meet NOAA's mission needs for tides and water levels. The NWLP is an end-to-end program that is planned, managed, and operated to provide products that meet user-driven needs. The program also consists of technology development, continuous quality control, data base management, and operational readiness and fully open web-site for data delivery. These data and related sea level products are made available over the web-site for use by PSMSL, UHSLC, and the WOCE communities.

Routine Sea Level Analysis Reports

There are 62 water level stations identified in the International Sea Level Workshop Report (1997) as being part of the core global subset for long term trends. The Climate Observations Program Plan calls these climate "reference stations" and includes the following performance measures for the reference stations.

1. Routinely deliver an annual report of the variations in relative annual mean sea level for the entire length of the instrumental record.

2. Routinely deliver an annual report of the monthly mean sea level trend for the past 100 years with 95% confidence interval.

The Climate Observation Program produces an annual report on the state of the ocean and the state of the observing system for climate. CO-OPS produces an annual report on the 62 reference stations that will be one section of that larger report. The current CO-OPS report on sea level (Zervas, 2001) has been used as a starting template for an annual report. In addition to the analysis of long-term sea level trends and monthly mean sea level analyses, a new product is being developed to present summaries of the exceedance probabilities at selected stations.

FY2007 Accomplishments

CO-OPS completed the development efforts for the routine analyses for the 62 reference stations that include the 18 NWLON stations and 44 non-NOAA global stations found at:

http://tidesandcurrents.noaa.gov/sltrends/sltrends_global.shtml

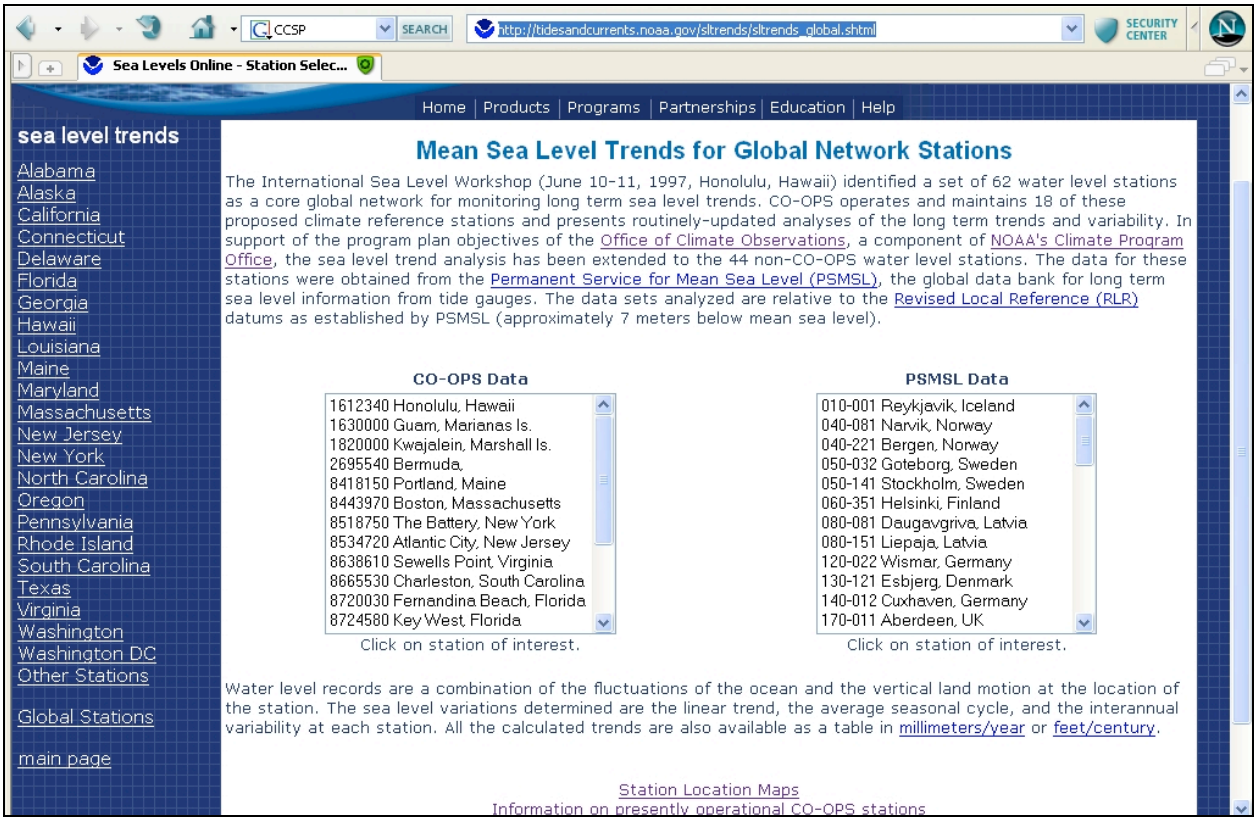

Figure 1. The new NOAA web-site for viewing information on sea level trends and monthly mean sea level anomalies at global tide stations.

The 18 NWLON stations that are part of the 62- station reference network are:

Name:	Series Length (years):
Atlantic City	90
Bermuda	59
Boston	80
Charleston	80
Crescent City	68
Fernandina Beach	104
Guam	53
Hampton Roads	74
Honolulu	96
Ketchikan	82
Key West	88
Kwajalein	55
Neah Bay	67
New York City	144
Pensacola	78
Portland	89
San Diego	95
San Francisco	150

The following figures illustrate the types of analyses being prepared for Honolulu:

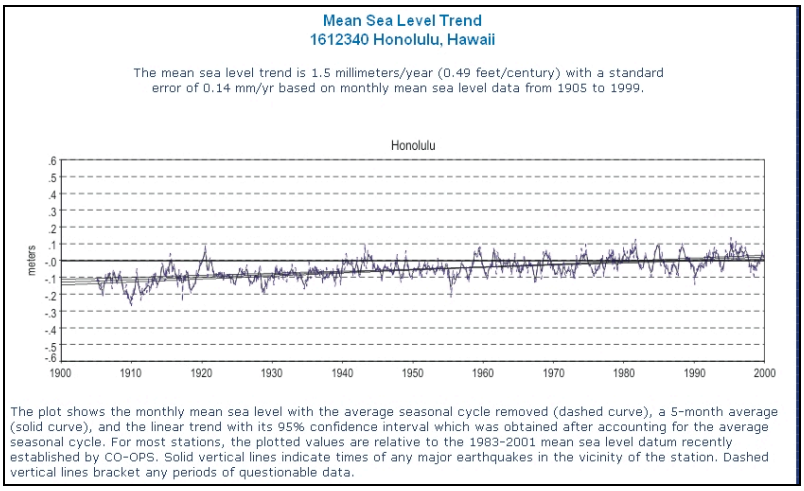

Figure 2. Sea level Trends Analyses are routinely updated.

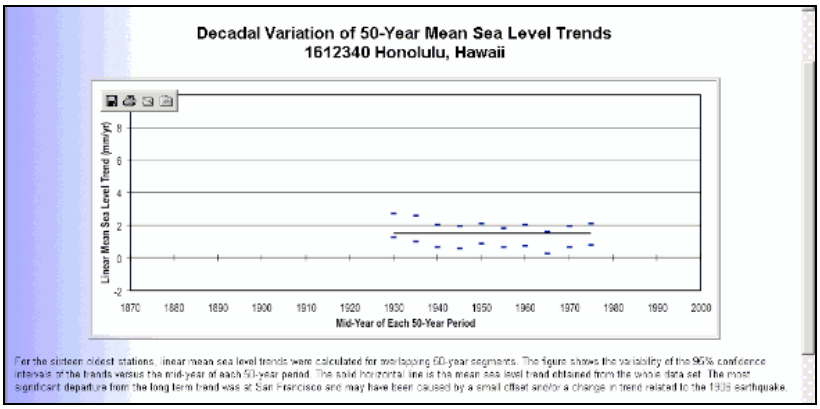

Figure 3. Long-term Variation in Trends are routinely updated.

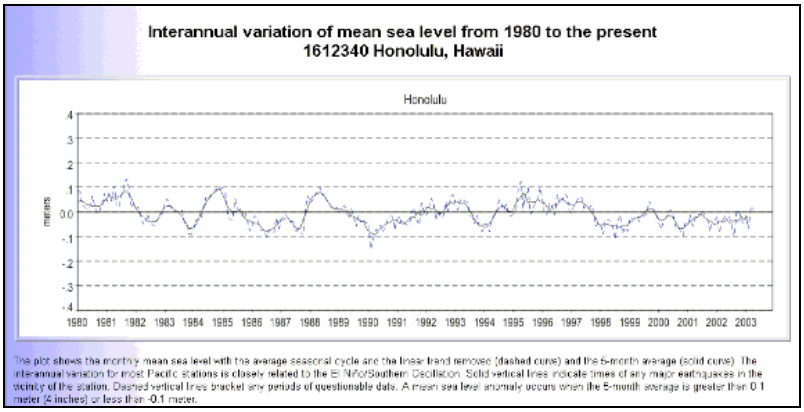

Figure 4. The Monthly Mean Sea Level anomalies are updated annually.

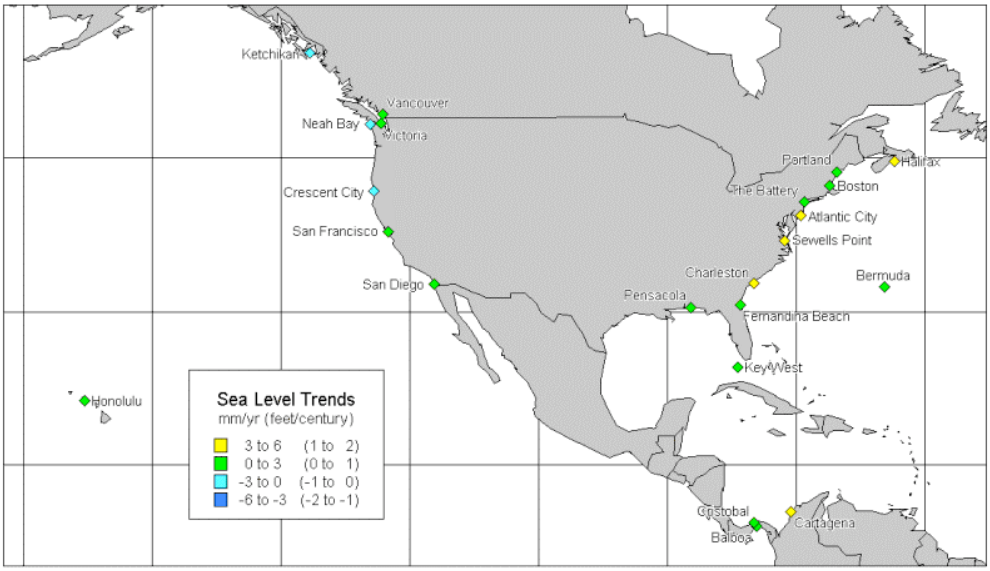

Figure 5. North America Relative Sea Level Trends

Similar sea level analyses have now been completed for the 44 non-NWLON stations. The monthly mean sea level data for these stations were obtained from the Permanent Service for Mean Sea Level (PSMSL) website. The data set obtained was their Revised Local Reference (RLR) data which has been carefully quality-controlled for datum continuity. The 44 stations are:

Station Name	Country	Year Range
Reykjavik	Iceland	45
Narvik	Norway	73
Bergen	Norway	118
Goteborg	Sweden	116
Stockholm	Sweden	114
Helsinki	Finland	122
Daugavgriva	Latvia	66
Liepaja	Latvia	71
Wismar	Germany	155
Esbjerg	Denmark	108
Cuxhaven	Germany	159
Aberdeen	UK	141
North Shields	UK	108
Newlyn	UK	88
Brest	France	193
Cascais	Portugal	111
Marseille	France	115
Genova	Italy	113
Trieste	Italy	96
Tuapse	Russia	85
Tenerife	Spain	72
Takoradi	Ghana	41
Aden	Yemen	90
Mumbai/Bombay	India	116
Vishakhapatnam	India	59
Ko Lak	Thailand	62
Xiamen	China	48
Mera	Japan	70
Aburatsubo	Japan	69
Tonoura/Hamada	Japan	108
Wajima	Japan	69
Manila	Philippines	68
Sydney	Australia	117
Fremantle	Australia	106
Auckland	New Zealand	97
Lyttelton	New Zealand	76
Vancouver	Canada	89
Victoria	Canada	90
Balboa	Panama	88

Quequen	Argentina	64
Buenos Aires	Argentina	82
Cartagena	Colombia	43
Cristobal	Panama	71
Halifax	Canada	107

The following example for these international stations follows the same presentation template using available data:

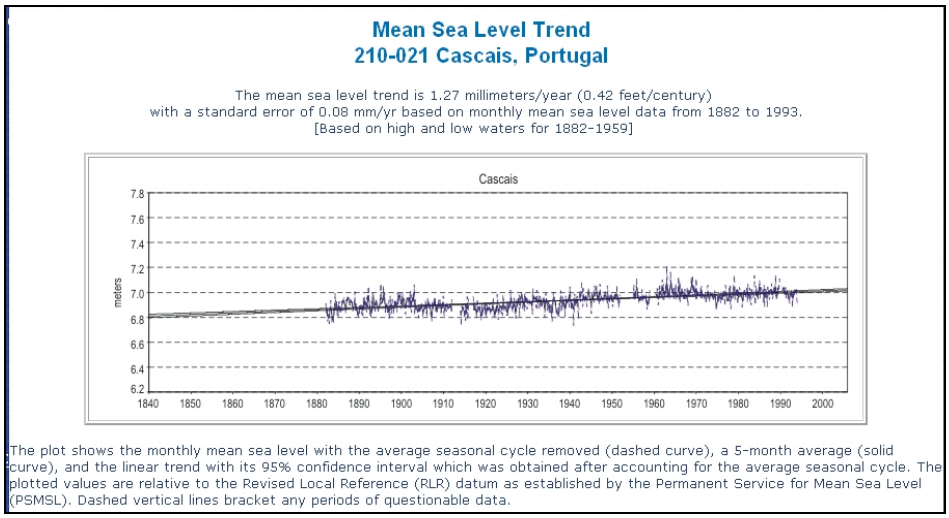

Figure 6. The Sea Level Trend Analysis

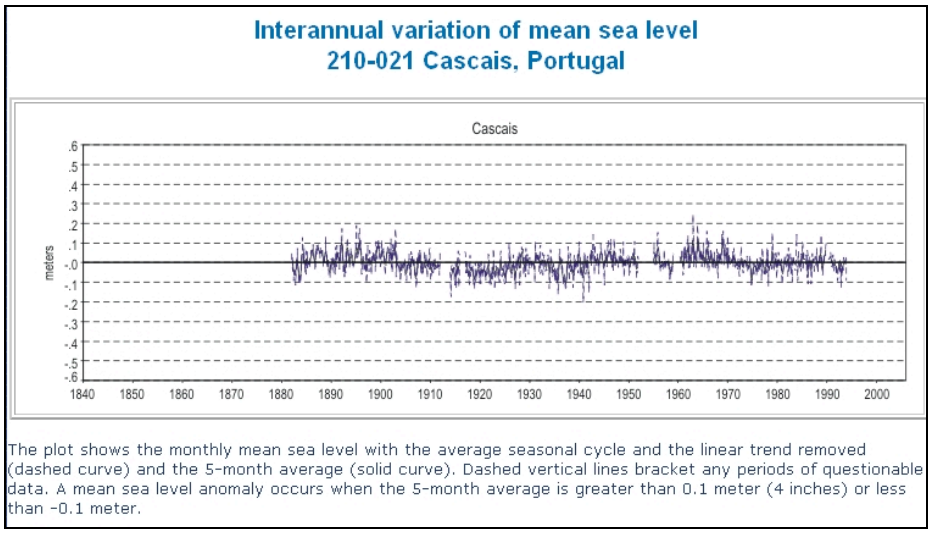

Figure 7. The interannual variation analysis.

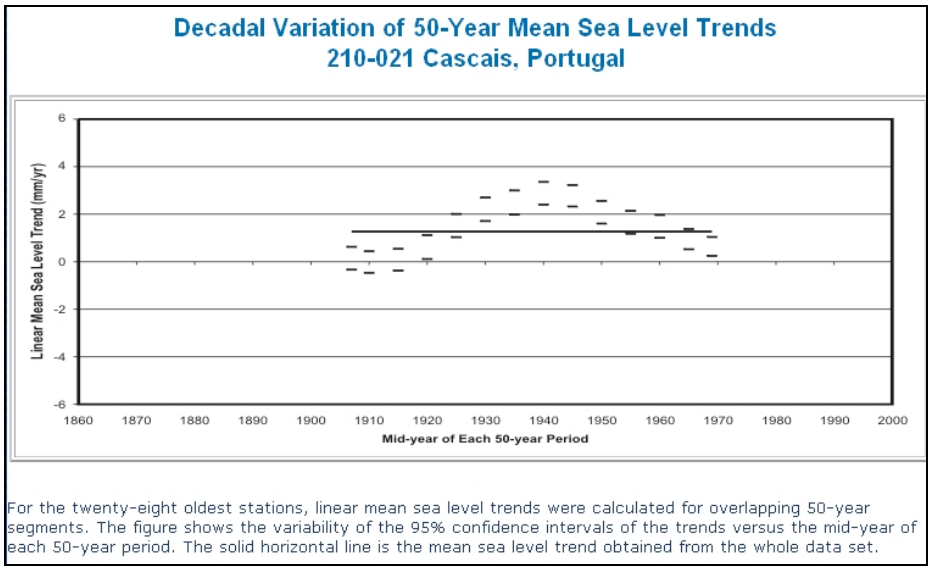

Figure 8. The decadal variation analysis.

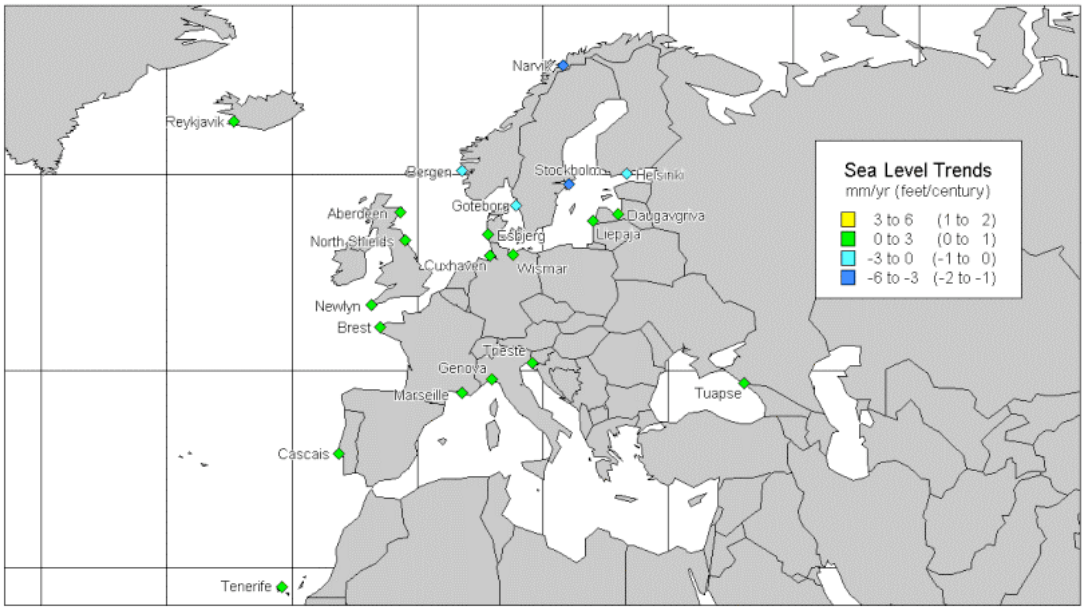

Figure 9. European Relative Sea Level Trends

In addition, production of Exceedance Probability Analysis for NWLON stations and work on development of a web-interface continued in FY2007.

Publications and Reports

Results, analyses, and data products are routinely updated and reported on via the CO-OPS web site at: http://tidesandcurrents.noaa.gov/sltrends/sltrends.html